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Washington 99019
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ENVIRONMENT

Mr. Eric Winiecki
EPA Project Coordinator
U.S. Environmental Protection Agency, Region 10
1200 Sixth Avenue, Suite 900
Seattle, WA 98101

Subject:
DOCKET NO. SDWA-10-2013-0080 – Yakima Valley Dairies
Liberty Dairy Monitoring Well DC-03 Investigation
[redacted], Granger, Washington

Date:
May 20, 2013

Contact:
Kevin M. Freeman, PG

Extension:
211

Email:
Kevin.Freeman@
arcadis-us.com

Our ref:
SK030326.0001

Dear Mr. Winiecki:

ARCADIS U.S., Inc. (ARCADIS), on behalf of Liberty Dairy LLC and its associated dairy facility H&S Bosma Dairy, presents the U.S. Environmental Protection Agency (EPA) this work plan for evaluating the potential impacts of a residential subsurface septic system on the shallow alluvial aquifer and the nearby EPA monitoring well DC-03. This work plan is submitted to EPA in accordance with the Yakima Valley Dairies Consent Order (CO) Statement of Work (SOW) Sections III.F.12. The subject septic system is located [redacted] Granger, Washington. This work plan presents the objectives and approach proposed for this investigation.

BACKGROUND

The septic system was permitted by the Yakima Health District August 3, 1978. The system is comprised of a 1,000-gallon, two-compartment septic tank. Effluent from the septic tank is distributed over a 600-square foot adsorption area by means of three 4-inch perforated drain tiles. The drain tiles are placed in gravel-filled trenches that are 3 feet wide and 67 feet long. The trenches are spaced approximately 10 feet apart and contain approximately one foot of washed drain gravel covered by approximately one foot of soil. A copy of the permit is included in Appendix A.

The drainfield is located approximately 275 feet southwest of monitoring well DC-03 (located along the east side right-of-way of Liberty Road). Well DC-03 is completed in the shallow alluvial aquifer to a total depth of 85 feet below ground surface (bgs). Static water level in the well at the time of installation measured approximately 72 feet bgs. Recent groundwater sampling by the U.S. Environmental Protection

Agency (EPA) conducted on January 2, 2013 detected nitrate in DC-03 at 190 milligrams per liter (mg/L).

OBJECTIVES

The objective of the tasks presented in this work plan include evaluating the potential impacts of the subsurface septic system on the shallow alluvial aquifer and determine if a hydraulic connection exists between the septic system and DC-03.

APPROACH

Records Review

Work includes reviewing existing information available from county, state and federal agencies. Records review will include but not be limited to 1) topographic maps, 2) published soils data available through the Natural Resource Conservation Service (NRCS), 3) county health department records pertaining to the permitting of sewage disposal systems, 4) water well reports for nearby wells on file with the Washington State Department of Ecology (Ecology).

Groundwater Evaluation

Groundwater conditions in and around the site will be evaluated by gauging water levels in nearby wells. Coordinates and elevations of gauged wells will be mapped using GPS. Elevations will be to the nearest 0.10-foot. Only wells that are physically accessible and where the owner has provided permission to access will be gauged.

Measured groundwater levels will be evaluated to determine groundwater flow direction and hydraulic gradient in and around the site. Water levels in the nearby Sunnyside Canal will also be determined.

Limited Subsurface Investigation

ARCADIS will perform a limited subsurface investigation to investigate subsurface soil conditions as it relates to the dispersion of septic effluent. The investigation will generally follow the protocols of the *Yakima Health District On-site Sewage System Program Site and Soil Evaluation* (Appendix B). These protocols include the excavation of test pits and percolation tests. Tracer tests will be performed on the system to evaluate effluent flow in the subsurface.

Health and Safety Plan Preparation

ARCADIS will prepare a site-specific Health and Safety Plan (HSP) in accordance with Occupational Safety and Health Administration (OSHA) regulations, as specified in Title 29 of the Federal Code of Regulations (CFR), Section 1910.120. The HASP will address physical, chemical, and biological hazards associated with typical subsurface investigations of this nature, specify the appropriate means to mitigate or control these hazards, and delineate general safety procedures to be followed while conducting field investigations at the Site. ARCADIS personnel will have a copy of the site-specific HASP at the project site for the duration of the field work.

Utility Clearance

ARCADIS will mark the proposed test pit locations and consult with the Washington State One Call. Also, ARCADIS will contract with a private utility locating company to locate underground utilities prior to the initiation of test pit excavation activities. ARCADIS staff will also conduct a visual site inspection of the property to identify potential utility lines. In this way ARCADIS will establish three lines of evidence of utility location prior to implementation of drilling activities.

Test Pits

ARCADIS will evaluate site soil conditions with respect to subsurface sewage disposal potential. The proposed work includes: (1) site reconnaissance by ARCADIS personnel to evaluate site characteristics and select test pit locations; (2) select and coordinate an excavation contractor; (3) test pit observation and logging, including collection of soil samples for grain-size analysis, and; (4) preparation of test pit logs containing observations and conclusions based on site and test pit observations. ARCADIS Standard Operating Procedures for conducting test pit investigations are presented in Appendix C.

A minimum of three test pits will be located a least 10 feet from the existing drainfield. Test pits will be excavated to a depth of at least four feet below the known bottom of the existing drainfield to determine if adequate vertical separation distance exists between the lowest portion of the drainfield and any limiting layer or groundwater.

To better assess unsaturated flow characteristics of the subsurface soils, percolation tests will be performed in select test pits. Percolation tests will provide information

related to percolation rates of the subsurface soils and provide guidance for dosing rates associated with the tracer tests described below. The procedures for conducting percolation tests are presented Appendix D.

Tracer Tests

ARCADIS will perform tracer tests on the subsurface septic system at the site. Tracer tests will include the introduction of a fluorescent septic dye (e.g., Bright Dyes) at a known quantity over a specific time period into the septic system. Tracer test procedures are presented in Appendix E. Water samples will be collected from well DC-03 on a quarterly basis (consistent with quarterly sampling completed as part of the YVD groundwater monitoring effort) to determine if a hydraulic connection exists between the septic system and the monitoring well.

Data Evaluation and Reporting

A report will be prepared by ARCADIS following the completion of the initial field work. This report will include data analysis and evaluation and present the findings and conclusions regarding test pit activities and dye placement. The report will be provided to EPA within 60 days following completion of field activities. ARCADIS will provide EPA a status of the tracer investigation monitoring as a separate memorandum, consistent with the YVD quarterly groundwater monitoring reporting schedule.

SCHEDULE

ARCADIS will begin work immediately following EPA approval of this work plan. Field activities, including placement of the tracer dye, will be completed within 60 days from receipt of EPA approval.

CLOSING

If you have questions regarding this proposal, please contact Kevin Freeman.

Sincerely,

ARCADIS U.S., Inc.

Kevin M. Freeman, PG
YVN Project Coordinator

Attachments:

Figure 1 – Site Map
Appendix A – [redacted] Septic Construction Permit
Appendix B – Yakima Health District On-site Sewage System Program Site and Soil Evaluation
Appendix C – ARCADIS Test Pit Excavation (NON-ENTRY) SOP
Appendix D – Percolation Test Procedures
Appendix E – Table of Septic Test Volumes & Septic Dye Amounts

Copies:

[redacted] Liberty Dairy LLC
Rene Fuentes, EPA
Jennifer MacDonald, EPA
Patrick W. Ryan, Perkins Coie LLP

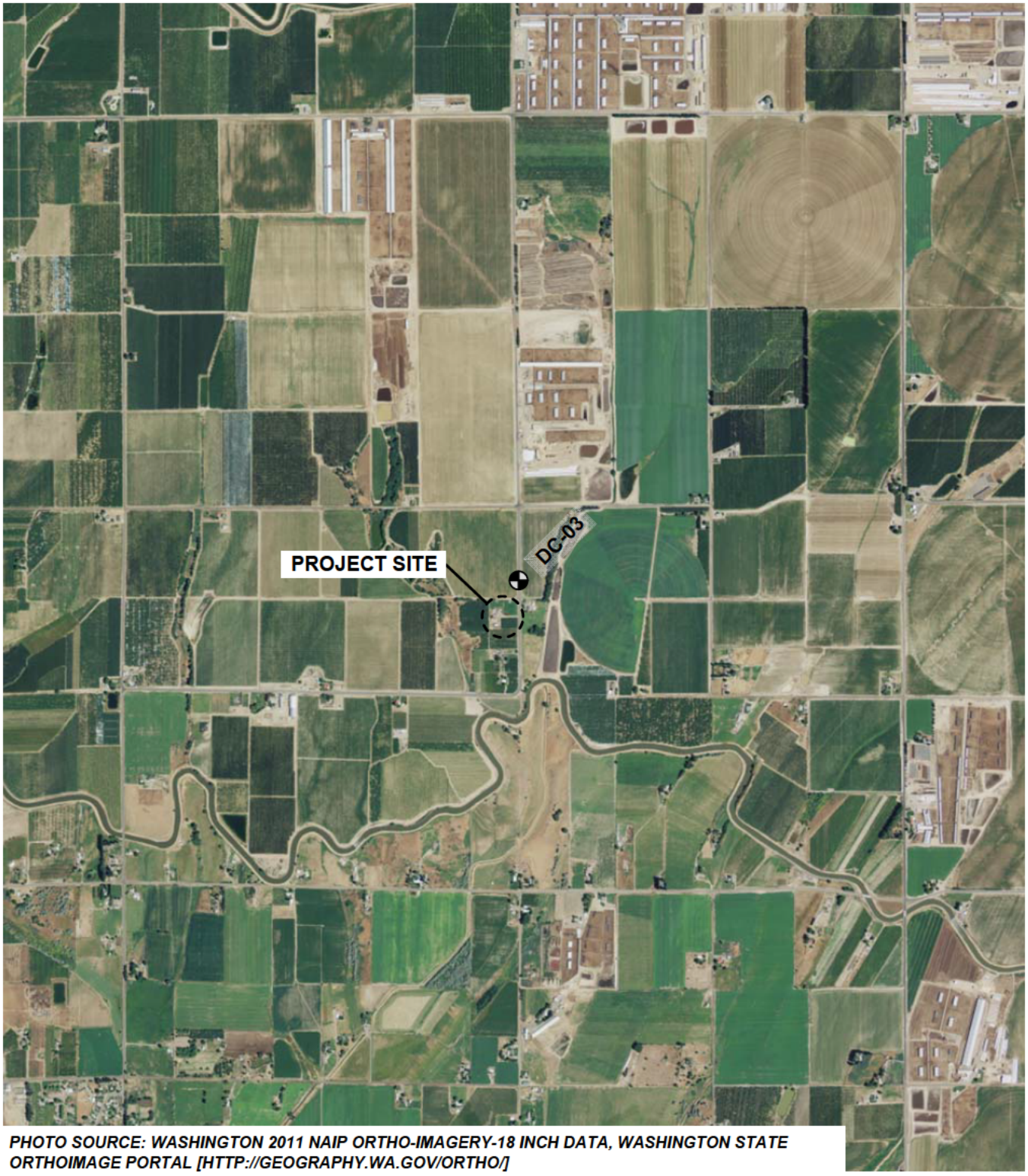


PHOTO SOURCE: WASHINGTON 2011 NAIP ORTHO-IMAGERY-18 INCH DATA, WASHINGTON STATE ORTHOIMAGE PORTAL [HTTP://GEOGRAPHY.WA.GOV/ORTHO/]

0 2,000
FEET

LIBERTY DAIRY LLC
YAKIMA VALLEY DAIRIES
DOCKET NO. SDWA-10-2013-0080
DC-03 WELL INVESTIGATION WORK PLAN

SITE VICINITY

ARCADIS

FIGURE
1

05152013

SK030326.0001.00008

Appendix A

[redacted] Septic Construction Permit

YAKIMA HEALTH DISTRICT

Sewage Disposal Permit Application

Parcel No. _____

Phone No. _____

Owner _____ (LAST) (FIRST) (MID. INIT.)

Owner's Address _____

Installation Address _____

Addition or Subdivision Name _____

Block _____ Lot _____ Size of Lot (acres or sq. ft.) _____

Type of Building: One Family _____ Two Family _____

Commercial (specify) _____

No. of Bedrooms _____ Max. No. of people in 24 hours _____

Any Cutting _____ Any Filling _____
(Indicate on plot plan)

Dwellings other than one family or duplexes require Commercial Design.

Source of water supply _____

Type of Permit:

System new building _____
Repair—a complete replacement _____
Soil Certification _____
On-site approval _____
Privy Permits _____

Soil Log Tests (Describe soils encountered preferably by FHA's uniform soil class system). Minimum depth 84 inches.

Hole No. 1 5' sandy clay loam

Hole No. 2 4½' sandy clay loam
2½' post hole same

Perc. Test Requested: Date _____ Perc. Test Completed _____

Evidence of Water Table. Distance from ground surface _____.

☒ Issue Permit Date 8-3-78 By DME

Specifications: Minimum Tank Size 1000 Gallons..
Minimum sq. ft. absorption area 600
Other APD STD

☐ No Design Required

☐ Permit Denied—see letter

☒ Installation Inspected and Approved:
Date 9/6/78 By BMH.

APPROVAL

Work Sheet

Date	Time Spent	Service	Initial
7-18	T.H. ready		
7-18	90 T.H. ✓	BM	KN
8-3	45	Design	DME
8/16		D/e drainage	BMH
	TD 3 67 foot lines		
	ND made less than 24" cover		
	recom. serial dist.		
9-6	system ready		
9-6	TD 2 Inspt		BMH

Directions to site. Show at least 2 crossroads and indicate north.

NOT TRANSFERABLE

ON-SITE SEWAGE DISPOSAL PERMIT
YAKIMA HEALTH DISTRICT

NOT TRANSFERABLE

Date Issued 8-3-78 Parcel No. [redacted]

Expires 8-3-79 if work not started

PERMISSION is hereby granted:

Name [redacted] to install/repair sewage disposal system

at

All work shall be done in accordance with Yakima District Board of Health Regulations and the following additional specifications:

1,000 Gallon 2 Compartment Septic Tank

600 Sq. Feet absorption area

Changes in building and/or system location or design may void permit.

IMPORTANT: Permit recipients must comply with all applicable municipal or county ordinances (including zoning ordinances) and the Uniform Building Code.

Bill McCaye
for Yakima County Health District

DO NOT COVER SYSTEM BEFORE APPROVED BY HEALTH DISTRICT

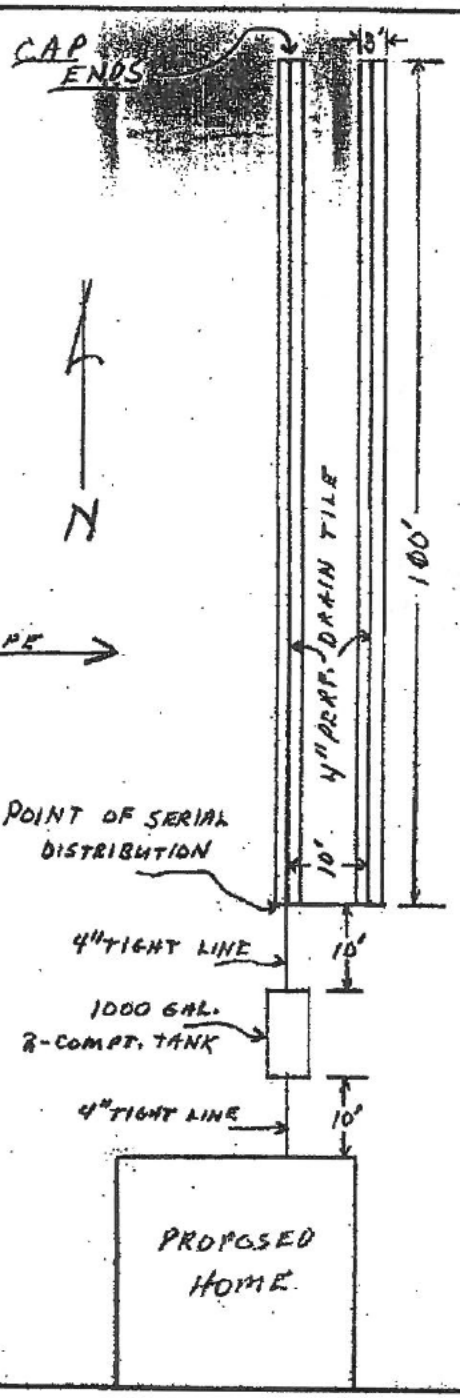
I hereby certify this system was installed under my supervision and control and complies with all provisions of Yakima Health District regulations. I have complied with all the restrictions and recommendations as listed by the registered engineer or Yakima Health District on their approved design, or latest approved revision thereof, dated 8-17-78

Size tank installed 1,000 gal. Sq. Ft. absorption area installed 600 sq ft

Other type installation

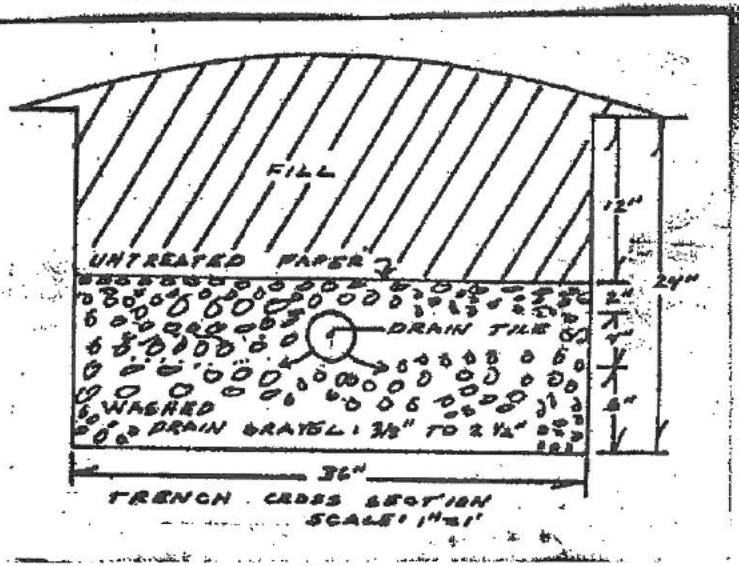
Signature of Installer O L Luther Dated 8-17-78

PERMIT



PLAN VIEW

SCALE: 1" = 20'



TRENCH CROSS SECTION
SCALE: 1" = 1'

NOTE:

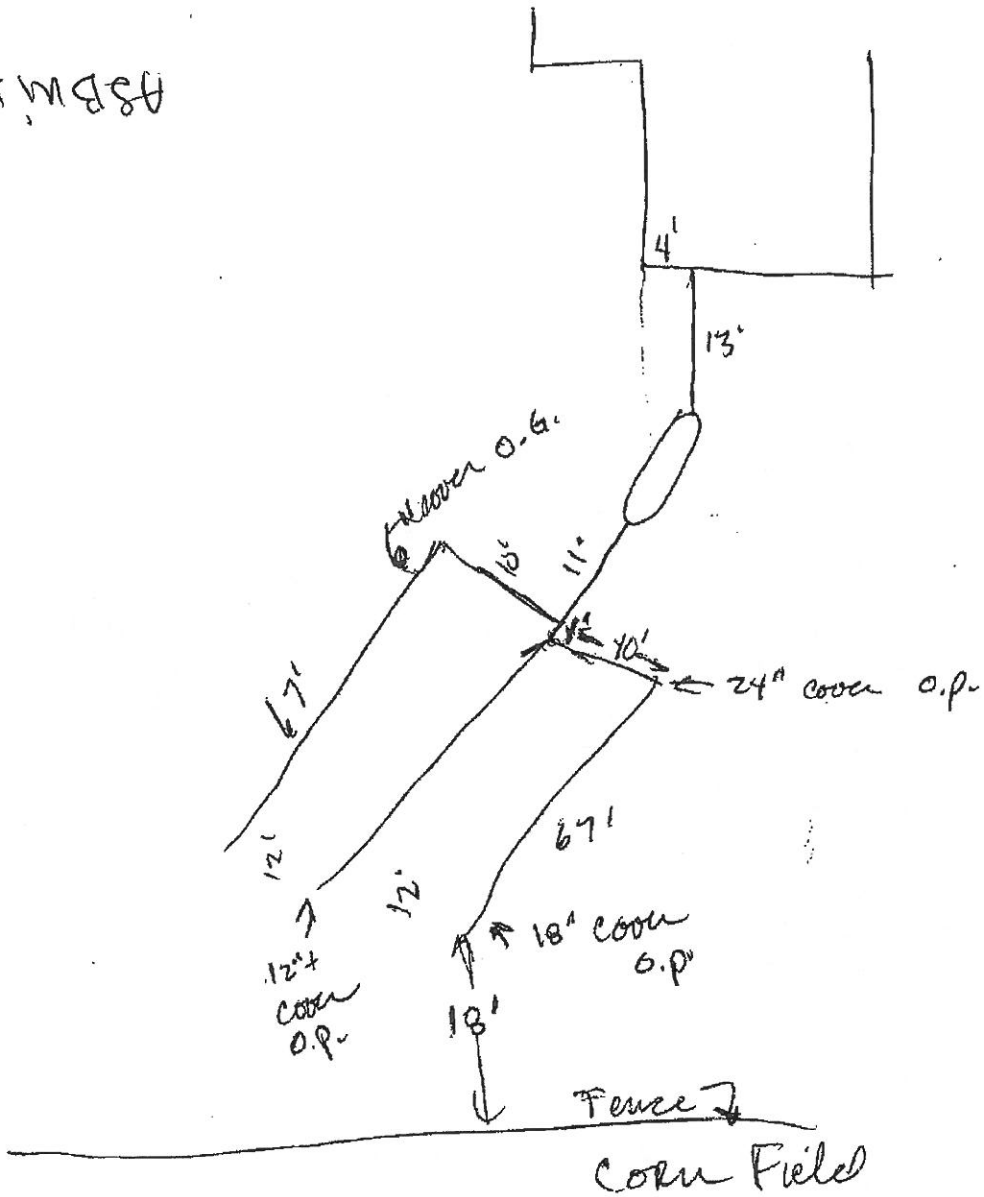
- ALL DRAINTILE MUST BE N.S.F. APPROVED.
- NO CONCRETE TILE TO BE USED.
- PROPER GRADE MUST BE MAINTAINED USE GRADE BOARDS, METAL SECURITY PINS, ETC. GRADE NOT TO EXCEED 6" PER 100'
- DRAINFIELD MUST BE 10' FROM BUILDINGS AND PROPERTY LINES. 100' FROM WELLS AND SURFACE WATERS.
- QUESTIONS AND CHANGES IN DESIGN ARE TO BE DIRECTED TO HEALTH DEPARTMENT STAFF.
- SYSTEM MUST BE INSPECTED BEFORE COVERING.

DESIGN

YAKIMA HEALTH DISTRICT
104 N. 1 St. 575-4040

[redacted]

DRAWN BY:	DATE:	PARCEL NO.
B.M.S	8-3-78	[redacted]


ASPHALT
4'
13'
Woven O.G.
15'
11'
10'
24" conc o.p.
67'
12'
12'
67'
12"+ conc o.p.
18" conc o.p.
18'
Fence
Corn Field

Appendix B

Yakima Health District On-site Sewage System Program Site and Soil Evaluation

Yakima Health District
On-site Sewage System Program

SITE AND SOIL EVALUATION

The first step in determining whether a lot or parcel of land is "buildable" is to have a **Site and Soil Evaluation** done (also known as soil certification, perk test, check testholes). Soils are not the only thing evaluated while at the property. Other factors that must be checked while on-site are slopes, cut banks, wells, surface waters (including irrigation and drainage ditches), driveways, easements, underground utilities or anything that may affect the installation and/or operation of a septic system.

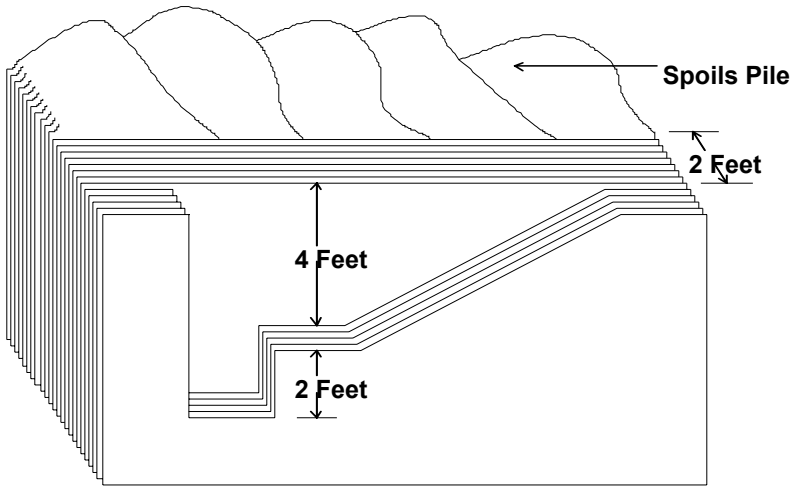
An on-site septic system can be designed for most lots or parcels. The limiting factors are usually soil depth and cost. A gravity flow (conventional) on-site septic system requires a minimum of 4 feet of suitable soil. (A 3 foot separation between the bottom of the drainfield trench and an impermeable layer or groundwater is required.) Sites with slopes exceeding 15 percent may require deeper soil depths for a gravity flow septic system. A site with less than 4 feet of soil requires an alternative septic system.

The soil information gathered during the evaluation of testholes is called a **soil log.** This information is used to determine the location, type and size of the septic system, drainfield and replacement area. When evaluating soils in testholes Yakima Health District (YHD) field staff must determine the type(s), as well as the depth of the soil at the site. Because different soils absorb water at different rates, soil type determines the size of the drainfield necessary to properly treat and dispose of the wastewater. Soil depth determines the type of system that can be installed at the site (i.e. standard trench, shallow-pressurized, sand filter, etc.).

A minimum of two (2) testholes **must** be dug for each proposed drainfield site and replacement area. Some sites may require additional testholes. The testholes are to be located in the area where the proposed system is to be located. They should be located approximately 75 to 100 feet apart and be dug to a depth of 6 feet (8 feet maximum). YHD field staff may advise you in determining where to locate your testholes. Testhole excavation should be stopped at a shallower depth if hardpan, bedrock or groundwater is encountered.

Testholes should be at least 2 feet wide to allow the YHD field staff easy access to observe and evaluate the soil's texture, structure, color, compaction, etc.. Angling one end of the testhole with a landing at the 4-foot level will allow easy access for YHD staff. An illustration of this is attached.

Testhole dimensions



The following definitions may help you better understand this information:

DEFINITIONS:

ALTERNATIVE SYSTEM: An on-site sewage system other than a gravity flow system. Properly operated and maintained, alternative systems provide equivalent or better treatment performance as compared to gravity flow systems. Generally all alternative systems require the use of effluent pumps and are pressure-dosed.

GRAVITY FLOW SYSTEM (CONVENTIONAL): An on-site sewage system consisting of a septic tank and drainfield, with the effluent from the tank being distributed to the drainfield by gravity flow.

EFFLUENT: The wastewater (sewage) after treatment by the septic tank.

HARDPAN: A hardened or cemented soil layer. The soil material is sandy, loamy, or clayey and is cemented by minerals, or other substance. This material inhibits water movement.

SOIL LOG: A detailed description of soil texture, structure and other soil characteristics encountered in a soil profile pit or testhole. The log provides information on the soil's ability to act as a treatment medium for effluent.

TESTHOLE: (aka soil profile pit) A testhole is a hole dug into the ground to expose the profile of the soil so the different soil types and layers can be evaluated and logged. A testhole is best dug with a backhoe. (Another name often used, but no longer accurate, is perk hole.)

Appendix C

ARCADIS Test Pit Excavation (NON-ENTRY) SOP

ARCADIS
Infrastructure, environment, facilities

Imagine the result

Test Pit Excavation (NON-ENTRY)

Rev. #: 2

Rev Date: May 28, 2008

Approval Signatures

Prepared by: Andrew Kamik Date: 5/28/2008

Reviewed by: Michael J Hefell Date: 5/28/2008
(Technical Expert)

I. Scope and Application

This SOP outlines policies and procedures for the advancement of test-pits using rubber-tire or track-mounted backhoes. For all work activities conducted by ARCADIS involving test pits or other excavations, ARCADIS staff will refer to and comply with ARCADIS HS Procedure No. ARC HSCS005, Excavation and Trenching. Test pits will be excavated using a decontaminated, rubber-tired backhoe or track-hoe as appropriate. Test pits may be performed based on the need to identify subsurface structures, facilitate the collection of soil samples and provide larger-scale subsurface characterization than allowed using soil borings. Personnel should stand upwind of the excavation area to the extent possible. Continuous air monitoring may be conducted as indicated in the site Health and Safety Plan (HASP). Excavating will be conducted at the selected locations that have been cleared for utilities until significant source materials, groundwater, or bedrock is encountered, or the purpose of the test pit has been met, or the physical limits of the backhoe have been reached. Test pit materials will be visually observed and described with respect to depth. Samples may be collected for laboratory or geotechnical analyses. Photographs of the test pits and excavated materials should be taken for future reference.

II. Personnel Qualifications

ARCADIS personnel overseeing, directing, or supervising the sampling portion of the test pit activities will have a minimum of 6 months of previous related experience under the supervision of an experienced (2 years) oversight person and at a minimum a 4-year degree (Bachelors) in environmental sciences, engineering, hydrogeology, or geology, and have completed health and safety training as required by OSHA Regulation 29 CFR 1910.120 (HAZWOPER). Personnel will also have completed any client-specific training as may be required. If the test pit is excavated by ARCADIS personnel, a competent person as defined by ARC HSCS005 will be on-site at all times.

If the test pit is excavated by a subcontractor, the subcontractor will provide the competent person per OSHA 1926.32(f). The excavation subcontractor will maintain all appropriate licenses and/or certifications as required by the State and Municipality. The equipment operator and any assistants working on site will, prior to beginning work, have completed all health and safety and other training as may be required by ARCADIS and the client.

III. Equipment List

The following equipment will be available, as required, during test pitting:

- rubber-tired (or track-mounted) backhoe in good working order;
- flame ionization detector (FID) and/or photoionization detector (PID), and/or other colorimetric;
- sample containers and forms;
- daily field log and/or field notebook;
- supplies and equipment to comply with site- and client-specific health and safety procedures;
- stainless steel shovel, scoop, hand auger, or trowel;
- digital camera;
- polyethylene sheeting; and
- ground stakes.

IV. Cautions

Water used for decontamination of excavation equipment will be of a quality acceptable for project objectives. Testing of water supply should be considered.

Work may be conducted on or in proximity to steep terrain. Site-specific health and safety issues will be thoroughly reviewed by all site personnel prior to beginning work.

V. Health and Safety Considerations

A site-specific Health and Safety Plan (HASP) meeting client requirements will be prepared along with Job Safety Analyses (JSAs) that outline the H&S hazards and controls for conducting the test pit activities. Project staff will review and be familiar with these plans and JSAs prior to work. These documents will detail the excavation safety requirements per ARC HSCS005. In addition, underground and above ground utilities will be located and cleared per ARCADIS H&S Procedure ARC HSFS019 – Utility Location.

VI. Procedures

Where necessary to characterize soil conditions, soil samples will be collected from the backhoe bucket, either directly or with a decontaminated stainless steel scoop or trowel.

Samples should be homogenized, if appropriate.

Material removed from the test pits during excavation will be placed on polyethylene sheeting. Visually clean soils will be segregated from soils that may contain source materials. Soils meeting field screening or laboratory analytical criteria may be placed back into the excavation. Soils not meeting screening or laboratory analytical criteria will be managed on site as described in the *Waste Management* section below. For sites that cannot be fully secured, clean fill will be available to backfill excavations immediately upon completion of test pits. To facilitate surveying, the location of the test pits will be marked with stakes after they have been backfilled. Stakes should be placed at the ends of the test pit and at any significant bend or corner, as appropriate.

VII. Waste Management

All water generated during decontamination procedures will be collected and contained onsite in 55-gallon drums or a temporary frac-tank pending laboratory analysis and appropriate disposal.

Personal protective equipment (such as gloves, disposable clothing, and other disposable equipment) resulting from personnel cleaning procedures and soil sampling/handling activities will be placed in plastic bags. These bags will be transferred into appropriately labeled 55-gallon drums for appropriate disposal.

Depending on volume generated, soil materials will be placed in sealed 55-gallon steel drums or stockpiled on site (placed on and covered by plastic sheeting). The material will be analyzed to determine the appropriate disposal method.

VIII. Data Recording and Management

The supervising geologist/engineer/scientist will be responsible for documenting activities using a daily field log to record all relevant information in a clear and concise format. As an alternative, a bound field notebook may be used at the discretion of field personnel to document field activities. Where appropriate, photographs will be taken to supplement written notes. The record of test pitting will include:

- start and finish dates of excavating;

- name and location of project;
- project number, client, and site location;
- sample number and depths;
- depth to water;
- observations of soil type/characteristics and lithology;
- documentation of any elevated organic vapor emissions;
- names of Contractor's personnel, inspectors, or other people onsite; and
- weather conditions.

IX. Quality Assurance

Equipment will be cleaned prior to use onsite. At the discretion of the ARCADIS Project Manager or field geologist/engineer/scientist, equipment may be decontaminated between each test pit location, and prior to leaving the site. All equipment and associated tools that may have come in contact with contaminated soils and/or waste materials will be cleaned with high-pressure steam cleaning equipment using a potable water source. More detailed equipment cleaning procedures are provided in the HASP.

X. References

United States Department of Labor. 1989. Occupational Safety & Health Administration (OSHA), Title 29 Code of Federal Regulations (CFR)Part 1926.651 Subpart P Excavations, .54 Federal Register (FR) 45959, October 31, 1989 and 59 FR 40730, Aug. 9, 1994.

ARCADIS HS Procedure No. ARC HSCS005, Excavation and Trenching, 12 May 2008.

ARCADIS H&S Procedure ARC HSFS019 – Utility Location, 22 February 2008

Appendix D

Percolation Test Procedures

PERCOLATION TEST PROCEDURE
INSTRUCTIONS

General Information - Complete the general information areas of sections 1., 2., and 3. at the top of the data sheet.

Location of Percolation Test Holes - The percolation(perc) test holes shall be spaced uniformly over the proposed soil absorption (leach field) site. **A minimum of three(3) test holes are required.** More than 3 can be used if desired.

Test Hole Preparation - Test holes that are 4 to 12 inches in diameter shall be dug or bored to the proposed depth of the leach field(typical depths are 30 to 42 inches). The side walls shall be vertical anda natural soil surface (one which is not smeared from digging) shall be exposed by scraping the sides and bottom of the test hole with a sharp pointed instrument. Any loose material shall be removed from the test hole and several inches of coarse sand or gravel placed in the bottom of the test hole in order to prevent scouring and sealing before the water is poured in.

Presoaking - **PRESOAKING IS ABSOLUTELY REQUIRED** in order to get valid percolation test results. The purpose of presoaking is to have the water conditions in the soil reach a stable condition similar to that which exists during continual wastewater application in a leach field. The minimum time of presoaking varies with soil type and soil conditions, but must be sufficiently long so that the water seeps away at a steady rate. The following presoaking instructions are usually sufficient to establish the proper soil moisture conditions.

a. Sandy or loose soils - Fill the test hole to within several inches of the top and allow it to seep away. Fill the hole a 2nd and 3rd time and let the water seep away. If the water continues to all seep away in ten(10) minutes or less, this indicates that the soil is excessively permeable and the site is unsuitable for a standard subsurface disposal system. In this case, the special requirements of Chapter 11, Section 36(d) shall be followed. If water remains after 10 minutes, then further presoaking is necessary before taking any measurements. Refer to the next section for further presoaking instructions.

b. Other suitable soils - If the soil is suitable for a standard subsurface leach field, then the test holes should be presoaked for at least 4 hours. Maintain at least 12 inches of water in the test holes for at least 4 hours, then allow the soil to swell for 12 hours (overnight is good) before starting the actual perc test measurements.

Perc Rate Measurements - Start the test by filling each test hole with approximately 12 to 18 inches of water. Let the soil rehydrate for about 15 minutes and then refill to 12 to 18 inches deep. Next, decide on a time interval for your test. Time intervals of 10 or 15 minutes are typical. Once decided, the **time interval must remain constant** throughout the test so that it can be determined when the water level drop rate has stabilized. Measure the initial water level (from a fixed reference point such as a flat board across the top of the hole) in each hole and record on the “Start” line in the test data table. To continue, record the actual water level in each hole at the end of each successive time interval. After each water level measurement, calculate the water level drop from the previous measurement and record in the test data table. Continue the test until the water level drop rate (right half of each column) has stabilized; ie. - 3 consecutive equal drop rates within 1/8 inch of each other. Please note that some test holes may take longer than others to stabilize. The test should be continued at each test hole until each drop rate stabilizes. Also please note, a minimum of 6 inches of water should be maintained in the test hole. If the level drops below 6 inches, some additional water should be added between time intervals. Before you use the test data sheet, **make several extra blank copies before you start** in case the tests take more than 10 intervals to stabilize or if you intend to use more than 3 test holes.

Perc Rate Calculation - After the water level drop rates have stabilized in all of the test holes, transfer the last water level drop measurement to the final drop row in the data table. To calculate the perc rate for each test hole, divide the time interval by the final drop. This is the perc rate in minutes per inch(mpi). Depending on how many test holes were used, determine the design percolation rate using either 3a or 3b at the bottom of the percolation test results data sheet.

An Example Test Data Sheet is provided on the back of these instructions to demonstrate how to record the data.

PERCOLATION TEST RESULTS

1. Performed by: Mike Plumber Test Date(s): 6-23 & 6-24, 99

   Credentials or Status of Tester: Contractor / installer

   (Owner, contractor, installer, engineer, geologist, sanitarian, soil scientist, or other)

2. The **time interval (ti)** between water level measurements was: 10 minutes.

3. **TEST DATA**: The test holes were **PRESOAKED** for: _____ hours, or X overnight

Test Hole # is:		1	2	3
Hole depth (inches) =		34 "	38 "	37 "
Interval Number	Elapsed Time	Water Level / Drop	Water Level / Drop	Water Level / Drop
Start =	0 min	17"		
		1 1/4		
1	10	18 1/4		
		1		
2	20	19 1/4		
		3/4		
3	30	20		
		5/8		
4	40	20 5/8		
		Refill		
5	50	15		
		1/2		
6	60	15 1/2		
	3/8			
7	70	15 7/8		
		1/2		
8	80	16 3/8		
Final Drop **(NOT Total)** =		1/2"		

Water level drop between intervals

The actual water level below the top of the test hole

Refill hole if needed and Re-measure actual water level

Continue test until 3 consecutive "drops" are the same to within 1/8 inch total variation

---

Perc rate(mpi) is:

[**ti** / Final Drop] = 10 / ½ = 20.0 mpi

a. If **6 or more holes** were tested, the **average perc rate** was: NA mpi, or

b. If **3 to 5 holes** were tested, the **slowest perc rate** (largest number) was: 20.0 mpi

PERCOLATION TEST RESULTS

1. Performed by: _____ Test Date(s): _____

   Credentials or Status of Tester: _____

   (Owner, contractor, installer, engineer, geologist, sanitarian, soil scientist, or other)

2. The **time interval (ti)** between water level measurements was: _____ minutes.

3. **TEST DATA**: The test holes were **PRESOAKED** for: _____ hours, or ___ overnight.

Test Hole # is:			
Hole depth (inches) =			
Interval Number	Elapsed Time	Water Level / Drop	Water Level / Drop	Water Level / Drop
Start =	0 min			
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
Final Drop (**NOT Total**) =				
Perc rate(mpi) is: [**ti** / Final Drop] =				

a. If **6 or more holes** were tested, the **average perc rate** was: _____mpi, or

b. If **3 to 5 holes** were tested, the **slowest perc rate** (largest number) was: _____ mpi.

LOADING RATE TABLE

Percolation Rate (minutes per inch)	Loading Rate	Percolation Rate (minutes per inch)	Loading Rate
	Cannot use	31	0.39
Less than 1 mpi	this generic	32	0.385
	package *	33	0.38
		34	0.375
1 to 5 mpi	0.80	35	0.37
6	0.75	36	0.365
7	0.71	37	0.36
8	0.68	38	0.357
9	0.65	39	0.353
10	0.62	40	0.35
11	0.60	41	0.347
12	0.58	42	0.343
13	0.56	43	0.34
14	0.54	44	0.337
15	0.52	45	0.333
16	0.505	46	0.33
17	0.49	47	0.327
18	0.48	48	0.325
19	0.47	49	0.323
20	0.46	50	0.32
21	0.45	51	0.318
22	0.44	52	0.316
23	0.435	53	0.314
24	0.43	54	0.312
25	0.42	55	0.31
26	0.415	56	0.308
27	0.41	57	0.306
28	0.405	58	0.304
29	0.40	59	0.302
30	0.395	60	0.30
		More than 60 mpi	Cannot use this generic Package *

* Note - If the perc rate for your site is less than 1 mpi or greater than 60 mpi, you cannot use this generic application package. You must hire a Professional Engineer and submit an application customized for your specific site conditions.

Appendix E

Table of Septic Test Volumes &
Septic Dye Amounts

Table of Septic Dye Test Volumes and Septic Dye Requirements

Also see The Septic Information Website - and see Septic Systems Inspection, Testing, & Maintenance online book on inspecting and maintaining septic systems, of which the document is a chapter. Technical review by industry experts has been performed and is ongoing - reviewers are listed at "References." Comments and suggestions for content are welcome.

CAUTION: appropriate test volumes may vary depending on the type of equipment installed. Some designs, such as dosing systems, may be approved by local officials but may be capable of only very limited fluid handling capacity per hour. Information provided by seller, realtor, visual inspection, or neighborhood history may indicate if special limited-capacity systems are installed. The following guidelines pertain to conventional tank and absorptions systems such as tank and trench-line drainfields.

The following table is a general guide to selecting the volume of test water and the amount of septic tracer dye needed to perform a septic loading and dye test. If you're asking "how much septic dye" or "how many septic dye tablets" should I use, look here and also look at the instructions from the manufacturer of your septic dye.

Table of Septic Loading Test Volumes & Septic Dye Amount	
Minimum septic dye test volume in gallons:	50 + 50 x (number of bedrooms), or 150 gallons (minimum), whichever is more. More or less, if information about system design indicates. Some inspectors use 75 gallons per bedroom for this calculation.
Desired septic dye test volume:	200 gallons. More or less, if information about system design indicates
Maximum septic dye test volume:	300 to 500 gallons. More or less, if information about system design indicates.
Number of Septic Dye Tablets to Use:	15 to 20 dye tablets for a 1200-gallon septic tank. This may vary by manufacturer. One tablet per test 50 gallons of *test volume* of water run will be insufficient. The test liquid is being diluted by the volume already present in the septic tank. Therefore a proper test needs to employ enough tablets to stain the expected volume of the tank. 10 tablets would be the bare minimum to dye a 500 gallon septic tank.
Amount of Septic Dye Powder to Use:	Minimum of one heaping tablespoon - about 1/100th of a pound or about 2/10 of an ounce by weight. Choose red or green based on area surface conditions.

	Green septic dye is fine for snowy conditions; red septic dye shows up better in grass. Yellow Green septic dye is better for detection of effluent if there is already murky brown surface water present. For fluorescent dyes, both dye color groups may be visible by using ultraviolet lighting, but home inspectors do not normally apply that method. The two colors will sometimes permit determination of which drain is connected to which septic tank or drywell.)
Volume of Liquid Septic Dye to Use:	1.6 oz (liquid) per 1,000 gallons of septic tank volume.

Notes to the Table of Septic Dye Test Volumes and Dye Amount

- Before selecting a test volume the inspector needs to know something about the design of the onsite wastewater disposal system that is installed. The table above assumes a conventional septic tank and drainfield are installed. If a dosing system, pumping system, or other special designs are present, flooding the system beyond the design-specifications for a given time period could damage the system or produce inappropriate test conclusions.

- The validity of a septic loading and dye test is *not* based on the length of time that water is run into building fixtures - though readers will see many inspectors who use this criterion. Rather the validity of the test depends on the *total volume of water that was placed into the system* along with other obvious procedural steps such as making sure that the fixtures used to introduce water into the system indeed drain into the septic system being tested and not to somewhere else.

- Calculating Septic Tank Volume: see Septic Tank Capacity vs Usage in Daily Gallons of Wastewater Flow calculating septic tank volume and septic tank size required

- Tramfloc Inc., (Tempe AZ) a producer of dye tablets and liquids, indicates the following dye amounts and capabilities:
    - One Bright Dyes Tramfloc Dye Tablet will color 60 gallons of water. So to color 600 gallons you'd need to use 10 tablets.
    - One pound of Tramfloc "Bright Dyes Standard Blue and FLT Yellow/Green will treat 120,000 gallons of water.
    - One pound of FWT Red Dye (more expensive to use) will treat 60,400 gallons.
    - One pint of liquid Standard Blue and FLT Yellow/Green will treat 12,500 gallons
    - One pint of liquid Red 25 will treat 6,250 gallons

- "Treat" in this instance means that a strong, easily visible color is produced.
- Where existing surface water is murky brown colored, Tramfloc recommends the FLT Yellow/Green tracer dye.
- Tramfloc Inc. informs us that their septic dye products are non-toxic and are rated for use in potable water. However inspectors who put any dye product into a toilet which overflows or into a drain which is leaking will stain the building.

DETERMINING TEST VOLUMES - Recommended Septic Loading: How to Determine Dye Test Water Volume, and Amount of Septic Dye

FIXTURE FLOW RATE - Estimate the test fixture flow rate during a septic test

Based on field experience, actual test measurements at 25 residences served by private well systems and observations of typical flow and pressure at residences served by municipal water supply systems, we find that 3 gpm is a reasonable estimate of flow from a single tub or un-screened sink fixture. Most private systems can deliver this volume.

Actual quantitative flow rate measurements taken at a single fixture at a single time are dangerously misleading since variations in pump pressure, pipe obstructions, valve settings, can affect flow.

If accurate quantitative measurement of flow rate is needed, and remembering that you're measuring the flow provided by the pump, pipes, valves, and fixtures, not the well flow capacity, a simple procedure is the use of a 5-gallon bucket under the test fixture, and a stopwatch. However multiple measurements may be needed to evaluate the variation in flow rate during the pump on-off cycle.

HOW TO SET THE SEPTIC TEST WATER VOLUME - determine the septic loading test water volume

Some authorities commonly test by loading the system with 50 gallons/bedroom over an hour - the likely maximum load for a typical residential system. A typical trench-type absorption field would contain this volume of water even if there were no percolation during the test period. Therefore breakout or failure at these volumes is a reasonable sign of system failure or inadequacy.

Typical septic system design handles 150 gallons/bedroom/day. [Ref. 30, Oberg, citing "Private Water Systems Handbook," produced by the US Dept. of Agriculture Cooperative Extension.]

Lockwood in our own article Septic Systems - An Engineer's View uses this same figure of 150 gallons/bedroom/day to estimate water usage in a typical residential building. Also see Home & Outdoor Living Water Requirements for more detail.

Keith Oberg (ASHI, Binghamton NY) computes that a standard leach line for soils in central NY range from 90 lineal feet with a 3 foot wide trench and a percolation rate of 1" in 5 minutes, to 375 lineal feet of 3 foot trench with a perc rate of 60 minutes.

The gravel in a standard trench leaves approximately 38% of total volume available to contain effluent. Therefore, assuming no percolation during the test period, the water level will rise 2.35" in a 90' trench and .56" in a 375' trench. (Double these depths for more narrow gravel trenches.) These are not excessive increases in a leaching field which is typically set at least 12" below the surface with 18" depth of gravel as standard practice. It is therefore apparent that an adequate septic system should not break out when subject to this test.

Oberg applies this same test to all septic systems of all types, including sand mounds, sand filters, aeration ponds, jet aerators, drywells, cesspools, etc. If there are multiple systems the water load is split on each system and a 33% extra water load is added to account for errors in estimation of the percentage of total use.